

Description

This invention relates to compositions useful as additives for lubricants, and, more particularly, for additives useful in multipurpose industrial oils for use in gear, hydraulic and other specialty applications. The invention particularly relates to sulfurized olefin-containing compositions and lubricants and concentrates containing such compositions.

It is well known that the high pressure which occurs in certain types of gears and bearings may cause rupture of lubricant films with consequent damage to the machinery. Because of the severe conditions under which they are used, industrial and gear lubricants ordinarily must contain additives which maximize their capability of functioning under extreme pressure conditions. It has been suggested that certain compounds of metal-reactive elements, such as compounds of chlorine, sulfur, phosphorus and lead impart extreme pressure properties to various lubricants. Among the various compositions known to serve this purpose are various phosphorus- and sulfur-containing compositions, chiefly salts and esters of dialkylphosphorodithioic acids, and sulfurization products of various aliphatic olefinic compounds. These two types of compositions have been used in combination in lubricants of this type, and they serve to increase the effectiveness of the lubricant under conditions of extreme pressure.

Many of the known sulfurization products of olefinic compounds contain substantial amounts of active sulfur. The presence of active sulfur in a lubricant often has deleterious side effects such as staining of copper parts, increased wear on the metal components being lubricated, and a decrease in extreme pressure properties with the passage of time.

Various compositions prepared by the sulfurization of olefins have been described in the prior art as being useful in lubricant compositions. For example, U.S. Patent 4,191,659 describes the preparation of sulfurized olefinic compositions by the catalytic reaction of sulfur and hydrogen sulfide with olefinic compounds containing from 3 to 30 carbon atoms. Such compounds are reported to be useful in lubricating compositions, particularly those prepared for use as industrial gear lubricants.

According to one aspect, the invention provides a composition comprising:

(A) at least one fatty acid ester containing olefinic unsaturation in the acid moiety and

(B) a sulfurization product of at least one of propylene, isobutene and dimers, trimers and tetramers thereof wherein the weight ratio of (A) to (B) is from about 0.2:1 to about 0.5:1.

Such compositions are useful as lubricant additive compositions, and more particularly, as additive compositions in industrial and gear lubricants. The compositions when added to lubricants provide longer lasting extreme pressure properties and anti-wear capability and reduce staining of copper parts.

Component A also is a fatty acid ester, or mixture thereof. The term "fatty acid" as used herein refers to acids which may be obtained by hydrolysis of naturally occurring vegetable or animal fats or oils. These fatty acids usually contain from 16 to 20 carbon atoms and are mixtures of saturated and unsaturated fatty acids. The unsaturated fatty acids generally contained in the naturally occurring vegetable or animal fats and oils may contain one or more double bonds and such acids include palmitoleic acid, oleic acid, linoleic acid, linolenic acid, petroselinic acid, erucic acid, gadoleic acid, vaccenic acid, ricinoleic acid and minor amounts of compounds containing more than 20 carbon atoms such as behenic acid.

The fatty acid esters which are useful as component A in the invention may be prepared from aliphatic olefinic acids of the type described above such as oleic acid, linoleic acid, linolenic acid, and behenic acid by reaction with alcohols and polyols. Examples of aliphatic alcohols which may be reacted with the above-identified acids include monohydric alcohols such as methanol, ethanol, n-propanol, isopropanol, the butanols, etc.; and polyhydric alcohols including ethylene glycol, propylene glycol, trimethylene glycol, neopentyl glycol, glycerol, etc.

The unsaturated fatty acid ester useful component A may be derived from mixtures of acids such as those obtained from tall oil or by the hydrolysis of peanut oil, soybean oil, cottonseed oil, sunflower seed oil, or wheat germ oil. Tall oil is a mixture of rosin acids, mainly abietic acid, and unsaturated fatty acids, mainly oleic and linoleic acids. Tall oil is a by-product of the sulfate process for the manufacture of wood pulp.

Of the esters for component (A), the most particularly preferred are the fatty oils, that is, naturally occurring esters of glycerol with the fatty acids described above, and synthetic esters of similar structure. Examples of naturally occurring fats and oils containing unsaturation include animal fats such as neat's-foot oil, lard oil, depot fat, beef tallow, etc. Examples of naturally occurring vegetable oils useful as component A include cottonseed oil, corn oil, poppy-seed oil, safflower oil, sesame oil, soybean oil, sunflower seed oil and wheat germ oil.

Component B in the compositions of this invention is a sulfurization product of at least one of propylene, isobutene and their dimers, trimers and tetramers. Of these compounds, isobutene and diisobutene are particularly desirable because of their availability and the particularly high sulfur-containing compositions which can be prepared therefrom.

The sulfurizing reagent used for the preparation of component B may be, for example, sulfur, a sulfur halide such as sulfur monochloride or sulfur dichloride, a mixture of hydrogen sulfide and sulfur or sulfur dioxide, or the like. Sulfur-hydrogen sulfide mixtures are often preferred and are frequently referred to hereinafter; however, it will be understood that other sulfurization agents may, when appropriate, be substituted therefor.

The amounts of sulfur and hydrogen sulfide per mole of olefinic compound are, respectively, usually about 0.3—3.0 gram-atoms and about 0.1—1.5 moles. The preferred ranges are about 0.5—2.0 gram-atoms and about 0.4—1.25 moles respectively, and the most desirable ranges are about 0.8—1.8 gram-atoms and about 0.4—0.8 mole respectively.

- 5 The temperature range in which the sulfurization reaction is carried out is generally about 50—350°C. The preferred range is about 100—200°C, with about 125—180°C being especially suitable. The reaction is often preferably conducted under superatmospheric pressure; this may be and usually is autogenous pressure (i.e., the pressure which naturally develops during the course of the reaction) but may also be
10 externally applied pressure. The exact pressure developed during the reaction is dependent upon such factors as the design and operation of the system, the reaction temperature, and the vapor pressure of the reactants and products and it may vary during the course of the reaction.

It is frequently advantageous to incorporate materials useful as sulfurization catalysts in the reaction mixture. These materials may be acidic, basic or neutral, but are preferably basic materials, especially
15 nitrogen bases including ammonia and amines. The amount of catalyst used is generally about 0.05—2.0% of the weight of the olefinic compound. In the case of the preferred ammonia and amine catalysts, about 0.0005—0.5 mole per mole of olefin is preferred, and about 0.001—0.1 mole is especially desirable.

Following the preparation of the sulfurized mixture, it is preferred to remove substantially all low boiling materials, typically by venting the reaction vessel or by distillation at atmospheric pressure, vacuum distillation or stripping, or passage of an inert gas such as nitrogen through the mixture at a
20 suitable temperature and pressure.

A further optional step in the preparation of component B is the treatment of the sulfurized product, obtained as described hereinabove, to reduce active sulfur. An illustrative method is treatment with an alkali metal sulfide as described in U.S. Patent 3,498,915. Other optional treatments may be employed to remove insoluble by-products and improve such qualities as the odor, color and staining characteristics of
25 the sulfurized compositions.

U.S. Patent 4,119,549 discloses suitable sulfurization products useful as component B. Several specific sulfurized compositions are described in the working examples thereof. The following example illustrates the preparation of one such composition.

30 Example A

Sulfur (629 parts, 19.6 moles) is charged to a jacketed high-pressure reactor which is fitted with an agitator and internal cooling coils. Refrigerated brine is circulated through the coils to cool the reactor prior to the introduction of the gaseous reactants. After sealing the reactor, evacuating to about 800 Pa (6 torr) and cooling, 1100 parts (19.6 moles) of isobutene, 334 parts (9.8 moles) of hydrogen sulfide and 7 parts of
35 n-butylamine are charged to the reactor. The reactor is heated using steam in the external jacket, to a temperature of about 171°C over about 1.5 hours. A maximum pressure of 5 MPa (720 psig) is reached at about 138°C during this heat-up. Prior to reaching the peak reaction temperature, the pressure starts to decrease and continues to decrease steadily as the gaseous reactants are consumed. After about 4.75 hours at about 171°C, the unreacted hydrogen sulfide and isobutene are vented to a recovery system. After
40 the pressure in the reactor has decreased to atmospheric, the sulfurized mixture is recovered as a liquid.

As mentioned above, the sulfurizing agent may be sulfur, and the reaction is effected by heating the olefinic compound with sulfur at a temperature of from 100—250°C, usually about 150—210°C with efficient agitation and in an inert atmosphere (e.g., nitrogen). The weight ratio of olefin to sulfur may be as high as 15:1 and is generally between about 5:1 and 10:1.

45 It is frequently advantageous to add the sulfur portionwise to the olefin. While it is usually preferred that the reaction mixture consist entirely of the olefin and sulfur, the reaction may be effected in the presence of an inert solvent such as alcohol, ether, ester, aliphatic hydrocarbon or halogenated aromatic hydrocarbon which is a liquid at the reaction temperatures employed.

Following the reaction, insoluble by-products may be removed by filtration, usually at an elevated
50 temperature (about 80—120°C). The filtrate is the desired sulfurized product.

The compositions of this invention contain components A and B in a weight ratio from about 0.2:1 to about 0.5:1. The compositions of the invention may be prepared merely by blending the ingredients, either undiluted or in substantially inert diluents. The diluent, if any, may be the oil used as a lubricant base and may include other additives such as those described hereinafter.

55 The following examples are illustrative of the compositions of this invention:

60

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TABLE I

Ingredient	Parts by weight Examples			
	1	2	3	4
Soybean oil	0.25		0.25	0.25
Cottonseed oil		0.20		
Product of Example A		0.40		0.62
Reaction product of isobutene with sulfur monochloride	0.62		0.68	

As previously indicated, the compositions of this invention are useful as additives for lubricants, in which they function primarily as extreme pressure and anti-wear agents; the addition of the compositions of the invention also results in a reduction in staining of copper parts. They can be employed in a variety of lubricants based on diverse oils of lubricating viscosity, including natural and synthetic lubricating oils and mixtures thereof. These lubricants include crankcase lubricating oils for spark-ignited and compression-ignited internal combustion engines, including automobile and truck engines, two-cycle engines, aviation piston engines, marine and railroad diesel engines, and the like. They can also be used in gas engines, stationary power engines and turbines and the like. Automatic transmission fluids, transaxle lubricants, metal-working lubricants, hydraulic fluids and other lubricating oil and grease compositions can also benefit from the incorporation therein of the compositions of the present invention. However, the compositions are particularly useful in gear lubricants and especially industrial gear lubricants.

Natural oils include liquid petroleum oils and solvent-treated or acid-treated mineral lubricating oils of the paraffinic, naphthenic and mixed paraffinic-naphthenic types. Oils of lubricating viscosity derived from coal or shale are also useful base oils. Synthetic lubricating oils include hydrocarbon oils and halo-substituted hydrocarbon oils such as polymerized and interpolymerized olefins [e.g., polybutylenes, polypropylenes, propylene-isobutylene copolymers, chlorinated polybutylenes, poly(1-hexenes), poly(1-octenes), poly(1-decenes), etc. and mixtures thereof]; alkylbenzenes [e.g., dodecylbenzenes, tetradecylbenzenes, dinonylbenzenes, di(2-ethylhexyl)benzenes, etc.]; polyphenyls [e.g., biphenyls, terphenyls, alkylated polyphenyls, etc.], alkylated diphenyl ethers and alkylated diphenyl sulfides and the derivatives, analogs and homologs thereof and the like.

Alkylene oxide polymers and interpolymers and derivatives thereof where the terminal hydroxyl groups have been modified by esterification, etherification, etc. constitute another class of known synthetic lubricating oils. These are exemplified by the oils prepared through polymerization of ethylene oxide or propylene oxide, the alkyl and aryl ethers of these polyoxyalkylene polymers [e.g., methylpolyisopropylene glycol ether having an average molecular weight of 1000, diphenyl ether of polyethylene glycol having a molecular weight of 500—1000, diethyl ether of polypropylene glycol having a molecular weight of 1000—1500, etc.] or mono- and polycarboxylic esters thereof, for example, the acetic acid esters, mixed C₃—C₈ fatty acid esters, or the C₁₃ Oxo acid diester of tetraethylene glycol.

Another suitable class of synthetic lubricating oils comprises the esters of dicarboxylic acids (e.g., phthalic acid, succinic acid, alkyl succinic acids and alkenyl succinic acids, maleic acid, azelaic acid, suberic acid, sebacic acid, fumaric acid, adipic acid, linoleic acid dimer, malonic acid, alkyl malonic acids, alkenyl malonic acids, etc.) with a variety of alcohols (e.g., butyl alcohol, hexyl alcohol, dodecyl alcohol, 2-ethylhexyl alcohol, ethylene glycol, diethylene glycol monoether, propylene glycol, etc.). Specific examples of these esters include dibutyl adipate, di(2-ethylhexyl) sebacate, di-n-hexyl fumarate, dioctyl sebacate, diisooctyl azelate, diisodecyl azelate, dioctyl phthalate, didecyl phthalate, dieicosyl sebacate, the 2-ethylhexyl diester of linoleic acid dimer, the complex ester formed by reacting one mole of sebacic acid with two moles of tetraethylene glycol and two moles of 2-ethylhexanoic acid, and the like.

Esters useful as synthetic oils also include those made from C₅ to C₁₂ monocarboxylic acids and polyols and polyol ethers such as neopentyl glycol, trimethylolpropane, pentaerythritol, dipentaerythritol, tripentaerythritol, etc.

Silicon-based oils such as the polyalkyl-, polyaryl-, polyalkoxy-, or polyaryloxy-siloxane oils and silicate oils comprise another useful class of synthetic lubricants [e.g., tetraethyl silicate, tetraisopropyl silicate, tetra-(2-ethylhexyl) silicate, tetra-(4-methyl-2-ethylhexyl) silicate, tetra-(p-tert-butylphenyl) silicate, hexa-(4-methyl-2-pentoxyl)-disiloxane, poly(methyl)-siloxanes, poly(methylphenyl)siloxanes, etc.]. Other synthetic lubricating oils include liquid esters of phosphorus-containing acids (e.g., tricresyl phosphate, trioctyl phosphate, diethyl ester of decylphosphonic acid, etc.), polymeric tetrahydrofurans and the like.

Unrefined, refined and re-refined oils (and mixtures of each with each other) of the type disclosed hereinabove can be used in the lubricant compositions of the present invention. Unrefined oils are those

obtained directly from a natural or synthetic source without further purification treatment. For example, a shale oil obtained directly from retorting operations, a petroleum oil obtained directly from distillation or ester oil obtained directly from an esterification process and used without further treatment would be an unrefined oil. Refined oils are similar to the unrefined oils except they have been further treated in one or more purification steps to improve one or more properties. Many such purification techniques are known to those of skill in the art such as solvent extraction, acid or base extraction, filtration, percolation, etc. Rerefined oils are obtained by processes similar to those used to obtain refined oils applied to refined oils which have been already used in service. Such rerefined oils are also known as reclaimed or reprocessed oils and often are additionally processed by techniques directed to removal of spent additives and oil breakdown products.

Generally, the lubricants of the present invention contain an amount of the composition of this invention sufficient to provide it with extreme pressure and anti-wear properties. Normally this amount will be about 0.01 to 10%, preferably about 0.01 to about 5% of the total weight of the lubricant. In lubricating oils operated under extremely adverse conditions, the reaction products of this invention may be present in amounts of up to about 20% by weight.

The invention also contemplates the use of other additives in combination with the compositions of this invention. Such additives include, for example, detergents and dispersants of the ash-producing or ashless type, corrosion- and oxidation-inhibiting agents, pour point depressing agents, auxiliary extreme pressure agents, color stabilizers and anti-foam agents.

The ash-producing detergents are exemplified by oil-soluble neutral and basic salts of alkali or alkaline earth metals with sulfonic acids, carboxylic acids, or organic phosphorus acids characterized by at least one direct carbon-to-phosphorus linkage such as those prepared by the treatment of an olefin polymer (e.g., polyisobutene having a molecular weight of 1000) with a phosphorizing agent such as phosphorus trichloride, phosphorus heptasulfide, phosphorus pentasulfide, phosphorus trichloride and sulfur, white phosphorus and a sulfur halide, or phosphorothioic chloride. The most commonly used salts of such acids are those of sodium, potassium, lithium, calcium, magnesium, strontium and barium.

The term "basic salt" is used to designate metal salts wherein the metal is present in stoichiometrically larger amounts than the organic acid radical. The commonly employed methods for preparing the basic salts involve heating a mineral oil solution of an acid with a stoichiometric excess of a metal neutralizing agent such as the metal oxide, hydroxide, carbonate, bicarbonate, or sulfide at a temperature above 50°C and filtering the resulting mass. The use of a "promoter" in the neutralization step to aid the incorporation of a large excess of metal likewise is known. Examples of compounds useful as the promoter include phenolic substances such as phenol, naphthol, alkylphenol, thiophenol, sulfurized alkylphenol, and condensation products of formaldehyde with a phenolic substance; alcohols such as methanol, 2-propanol, octyl alcohol, cellosolve, carbitol, ethylene glycol, stearyl alcohol, and cyclohexyl alcohol; and amines such as aniline, phenylenediamine, phenothiazine, phenyl-β-naphthylamine, and dodecylamine. A particularly effective method for preparing the basic salts comprises mixing an acid with an excess of a basic alkaline earth metal neutralizing agent and at least one alcohol promoter, and carbonating the mixture at an elevated temperature such as 60–200°C.

Ashless detergents and dispersants are so called despite the fact that, depending on its constitution, the dispersant may upon combustion yield a non-volatile material such as boric oxide or phosphorus pentoxide; however, it does not ordinarily contain metal and therefore does not yield a metal-containing ash on combustion. Many types are known in the art, and any of them are suitable for use in the lubricants of this invention. The following are illustrative:

(1) Reaction products of carboxylic acids (or derivatives thereof) containing at least about 34 and preferably at least about 54 carbon atoms with nitrogen-containing compounds such as amine, organic hydroxy compounds such as phenols and alcohols, and/or basic inorganic materials. Examples of these "carboxylic dispersants" are described in British Patent 1,306,529 and in many U.S. Patents including the following:

50	3,163,603	3,351,552	3,541,012
	3,184,474	3,381,022	3,542,678
	3,215,707	3,399,141	3,542,680
	3,219,666	3,415,750	3,567,637
55	3,271,310	3,433,744	3,574,101
	3,272,746	3,444,170	3,576,743
	3,281,357	3,448,048	3,630,904
	3,306,908	3,448,049	3,632,510
	3,311,558	3,451,933	3,632,511
60	3,316,177	3,454,607	3,697,428
	3,340,281	3,467,668	3,725,441
	3,341,542	3,501,405	Re 26,433
	3,346,493	3,522,179	

(2) Reaction products of relatively high molecular weight aliphatic or alicyclic halides with amines,

preferably polyalkylene polyamines. These may be characterized as "amine dispersants" and examples thereof are described for example, in the following U.S. patents:

3,275,554	3,454,555
3,438,757	3,565,804

(3) Reaction products of alkyl phenols in which the alkyl group contains at least about 30 carbon atoms with aldehydes (especially formaldehyde) and amines (especially polyalkylene polyamines), which may be characterized as "Mannich dispersants". The materials described in the following U.S. Patents are illustrative:

2,459,112	3,442,808	3,591,598
2,962,442	3,448,047	3,600,372
2,984,550	3,454,497	3,634,515
3,036,003	3,459,661	3,649,229
3,166,516	3,461,172	3,697,574
3,236,770	3,493,520	3,725,277
3,355,270	3,539,633	3,725,480
3,368,972	3,558,743	3,726,882
3,413,347	3,586,629	3,980,569

(4) Products obtained by post-treating the carboxylic, amine or Mannich dispersants with such reagents as urea, thiourea, carbon disulfide, aldehydes, ketones, carboxylic acids, hydrocarbon-substituted succinic anhydrides, nitriles, epoxides, boron compounds, phosphorus compounds or the like. Exemplary materials of this kind are described in the following U.S. Patents:

3,036,003	3,282,955	3,493,520	3,639,242
3,087,936	3,312,619	3,502,677	3,649,229
3,200,107	3,366,569	3,513,093	3,649,659
3,216,936	3,367,943	3,533,945	3,658,836
3,254,025	3,373,111	3,539,633	3,697,574
3,256,185	3,403,102	3,573,010	3,702,757
3,278,550	3,442,808	3,579,450	3,703,536
3,280,234	3,455,831	3,591,598	3,704,308
3,281,428	3,455,832	3,600,372	3,708,522

(5) Interpolymers of oil-solubilizing monomers such as decyl methacrylate, vinyl decyl ether and high molecular weight olefins with monomers containing polar substituents, e.g., aminoalkyl acrylates or acrylamides and poly-(oxyethylene)-substituted acrylates. These may be characterized as "polymeric dispersants" and examples thereof are disclosed in the following U.S. Patents:

3,329,658	3,666,730
3,449,250	3,687,849
3,519,565	3,702,300

The above-noted patents disclose ashless dispersants.

Auxiliary extreme pressure agents and corrosion- and oxidation-inhibiting agents are exemplified by chlorinated aliphatic hydrocarbons such as chlorinated wax; aromatic sulfides and polysulfides such as benzyl disulfide, bis(chlorobenzyl) disulfide, and sulfurized alkylphenol; phosphosulfurized hydrocarbons such as the reaction product of a phosphorus sulfide with turpentine or methyl oleate; phosphorus esters including principally dihydrocarbon and trihydrocarbon phosphites such as dibutyl phosphite, diheptyl phosphite, dicyclohexyl phosphite, pentylphenyl phosphite, dipentylphenyl phosphite, tridecyl phosphite, distearyl phosphite, dimethyl naphthyl phosphite, oleyl 4-pentylphenyl phosphite, polypropylene (molecular weight 500)-substituted phenyl phosphite, diisobutyl-substituted phenyl phosphite; metal thiocarbamates, such as zinc dioctyldithiocarbamate, and barium heptylphenyl dithiocarbamate; Group II metal phosphorodithioates such as zinc dicyclohexylphosphorodithioate, zinc dioctylphosphorodithioate, barium di(heptylphenyl)phosphorodithioate, cadmium dinonylphosphorodithioate, and the zinc salt of a phosphorodithioic acid produced by the reaction of phosphorus pentasulfide with an equimolar mixture of isopropyl alcohol and n-hexyl alcohol.

The compositions of this invention can be added directly to the lubricant. Preferably, however, they are diluted with a substantially inert, normally liquid organic diluent such as mineral oil, naphtha, benzene, toluene or xylene, to form an additive concentrate. These concentrates usually contain about 20—90% by weight of the composition of this invention such as the compositions of Examples 1—6 and may contain, in addition, one or more other additives known in the art or described hereinabove.

Illustrative lubricants of this invention comprise principally mineral oil (e.g., SAE 10W—40 for an

internal combustion engine lubricant and SAE 75W—90 for a gear lubricant) in combination with about 0.5—5.0% by weight or more of the composition of the invention such as Examples 1—4 and with other known lubricant additives. The following specific examples in Table II illustrate lubricating compositions according to the invention. Unless otherwise indicated, all amounts listed, except those for mineral oil, are exclusive of oil present as diluent.

TABLE II

		Parts by weight Examples			
		5	6	7	8
	Mineral oil	98.58	98.58	98.64	98.57
	Product of Example 1	—	.87	—	—
	3	—	—	—	0.94
	4	0.87	—	0.87	—
	Amine-neutralized hydroxyalkyl dialkylphosphorodithioate	—	—	0.40	0.40
	Alkyl acrylate-dialkylphosphorodi- thioic acid adduct	0.40	0.40	—	—
	Hydroxypropyl tetrapropenyl succinate	0.06	0.06	—	—
	Polyoxyalkylene demulsifier	0.005	0.005	0.005	0.005
	N-Tridecyltrimethylenediamine	0.05	0.05	0.05	0.05
	Tolyltriazole	0.015	0.015	0.015	0.015
	Silicone anti-foam agent	0.02	0.02	0.02	0.02

35 Claims

1. A composition comprising:
(A) at least one fatty acid ester containing olefinic unsaturation in the acid moiety and
(B) a sulfurization product of at least one of propylene, isobutene and dimers, trimers and tetramers thereof, wherein the weight ratio of (A) to (B) is from about 0.2:1 to about 0.5:1.
2. A composition according to Claim 1 wherein component A contains at least about 8 carbon atoms.
3. A composition according to either of the preceding claims wherein component A is at least one fatty oil.
4. A composition according to claim 3 wherein component A is soybean oil.
5. A composition according to either of claims 1 or 2 wherein the fatty acid is tall oil acid.
6. A composition according to any one of the preceding claims wherein component B is prepared by reacting the olefinic compound with a sulfur halide or a mixture of sulfur and hydrogen sulfide.
7. A composition according to claim 6 wherein component B is prepared by reacting isobutene with a mixture of sulfur and hydrogen sulfide.
8. A composition according to claim 6 wherein component B is prepared by reacting isobutene with a sulfur halide.
9. A composition according to claim 8 wherein the sulfur halide is sulfur monochloride.
10. An additive concentrate comprising a substantially inert, normally liquid organic diluent and from about 20 to 90 percent by weight of a composition according to any one of the preceding claims.
11. A lubricating composition comprising a major amount of a lubricating oil and a minor amount of a composition according to any one of claims 1—9.

Patentansprüche

1. Eine Zusammensetzung, umfassend:
(A) mindestens einen eine olefinische Unsatigung in der Säureinheit enthaltenden Fettsäureester und
(B) ein Schwefelungsprodukt mindestens einer der Verbindungen Propylen, Isobuten oder deren Dimeren, Trimeren und Tetrameren, wobei das Gewichtsverhältnis von (A) zu (B) etwa 0,2:1 bis etwa 0,5:1 beträgt.

internal combustion engine lubricant and SAE 75W-90 for a gear lubricant) in combination with about 0.5-5.0% by weight or more of the composition of the invention, such as Examples 1-4 and with other known lubricant additives. The following specific examples in Table II illustrate lubricating compositions according to the invention. Unless otherwise indicated, all amounts listed, except those for mineral oil, are exclusive of oil present as diluent.

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15	3	—	—	—	0.94
	4	0.87	—	0.87	—
	Amine-neutralized hydroxyalkyl dialkylphosphorodithioate	—	—	0.40	0.40
20	Alkyl acrylate-dialkylphosphorodi- thioic acid adduct	0.40	0.40	—	—
	Hydroxypropyl tetrapropenyl succinate	0.06	0.06	—	—
25	Polyoxyalkylene demulsifier	0.005	0.005	0.005	0.005
	N-Tridecyltrimethylenediamine	0.05	0.05	0.05	0.05
30	Tolyltriazole	0.015	0.015	0.015	0.015
	Silicone anti-foam agent	0.02	0.02	0.02	0.02

35 Claims

1. A composition comprising:
 - (A) at least one fatty acid ester containing olefinic unsaturation in the acid moiety and
 - (B) a sulfurization product of at least one of propylene, isobutene and dimers, trimers and tetramers
 thereof, wherein the weight ratio of (A) to (B) is from about 0.2:1 to about 0.5:1.
2. A composition according to Claim 1 wherein component A contains at least about 8 carbon atoms.
3. A composition according to either of the preceding claims wherein component A is at least one fatty oil.
4. A composition according to claim 3 wherein component A is soybean oil.
5. A composition according to either of claims 1 or 2 wherein the fatty acid is tall oil acid.
6. A composition according to any one of the preceding claims wherein component B is prepared by reacting the olefinic compound with a sulfur halide or a mixture of sulfur and hydrogen sulfide.
7. A composition according to claim 6 wherein component B is prepared by reacting isobutene with a mixture of sulfur and hydrogen sulfide.
8. A composition according to claim 6 wherein component B is prepared by reacting isobutene with a sulfur halide.
9. A composition according to claim 8 wherein the sulfur halide is sulfur monochloride.
10. An additive concentrate comprising a substantially inert, normally liquid organic diluent and from about 20 to 90 percent by weight of a composition according to any one of the preceding claims.
11. A lubricating composition comprising a major amount of a lubricating oil and a minor amount of a composition according to any one of claims 1-9.

Patentansprüche

1. Eine Zusammensetzung, umfassend:
 - (A) mindestens einen eine olefinische Unsättigung in der Säureeinheit enthaltenden Fettsäureester und
 - (B) ein Schwefelungsprodukt mindestens einer der Verbindungen Propylen, Isobuten oder deren Dimeren, Trimeren und Tetrameren, wobei das Gewichtsverhältnis von (A) zu (B) etwa 0,2:1 bis etwa 0,5:1 beträgt.



2. Zusammensetzung nach Anspruch 1, in der Komponente A mindestens etwa 8 Kohlenstoffatome enthält.

3. Zusammensetzung nach einem der vorangehenden Ansprüche, in der Komponente A mindestens ein Fettöl ist.

4. Zusammensetzung nach Anspruch 3, in der Komponente A Sojabohnenöl ist.

5. Zusammensetzung nach Anspruch 1 oder 2, in der die Fettsäure Tallölsäure ist.

6. Zusammensetzung nach einem der vorangehenden Ansprüche, in der die Komponente B durch Umsetzung der olefinischen Verbindung mit einem Schwefelhalogenid oder einem Gemisch aus Schwefel und Schwefelwasserstoff hergestellt wird.

7. Zusammensetzung nach Anspruch 6, in der die Komponente B durch Umsetzung von Isobuten mit einem Gemisch aus Schwefel und Schwefelwasserstoff hergestellt wird.

8. Zusammensetzung nach Anspruch 6, in der die Komponente B durch Umsetzung von Isobuten mit einem Schwefelhalogenid hergestellt wird.

9. Zusammensetzung nach Anspruch 8, in der das Schwefelhalogenid Schwefelmonochlorid ist.

10. Additivkonzentrat, umfassend ein im wesentlichen inertes, normalerweise flüssiges organisches Verdünnungsmittel und etwa 20 bis 90 Gew.-% einer Zusammensetzung nach einem der vorangehenden Ansprüche.

11. Schmiermittelzusammensetzung, umfassend eine größere Menge eines Schmieröls und eine kleinere Menge einer Zusammensetzung nach einem der Ansprüche 1 bis 9.

Revendications

1. Une composition comportant:

(A) au moins un ester d'acide gras renfermant une insaturation oléfinique dans la partie acide, et

(B) un produit de sulfuration d'au moins un composé choisi parmi le propylène, l'isobutène et leurs dimères, trimères et tétramères, dans lequel le rapport pondéral de (A) à (B) est d'environ 0,2:1 à environ 0,5:1.

2. Une composition selon la revendication 1, dans laquelle le composant A contient au moins environ 8 atomes de carbone.

3. Une composition selon l'une quelconque des revendications précédentes, dans laquelle le composant A est au moins une huile grasse.

4. Une composition selon la revendication 3, dans laquelle le composant A est de l'huile de soja.

5. Une composition selon l'une quelconque des revendications 1 ou 2, dans laquelle l'acide gras est un acide de tallol.

6. Une composition selon l'une quelconque des revendications précédentes, dans laquelle le composant B est préparé par réaction du composé oléfinique avec un halogénure de soufre ou un mélange de soufre et de sulfure d'hydrogène.

7. Une composition selon la revendication 6, dans laquelle le composant B est préparé par réaction de l'isobutène avec un mélange de soufre et de sulfure d'hydrogène.

8. Une composition selon la revendication 6, dans laquelle le composant B est préparé par réaction de l'isobutène avec un halogénure de soufre.

9. Une composition selon la revendication 8, dans laquelle l'halogénure de soufre est du monochlorure de soufre.

10. Un concentré d'additif comportant un diluant pratiquement inerte, habituellement liquide, et d'environ 20 à 90% en poids d'une composition selon l'une quelconque des revendications précédentes.

11. Une composition lubrifiante comportant une quantité prédominante d'huile lubrifiante et une faible quantité d'une composition selon l'une quelconque des revendications 1 à 9.

